MANGALORE UNIVERSITY

DEPT. OF MARINE GEOLOGY
M. Sc. GEOINFORMATICS (CHOICE BASED CREDIT SYSTEM) - SYLLABUS
STRUCTURE OF THE PROGRAMME

Program- outcome

The knowledge gained will help the students to increase their ability and they can independently carry out higher studies leading to Ph.D. degree and can join reputed institutes, can also carry out consultancy work to solve earth related problems using geospatial techniques.

The students can develop the ability to carry out the project work independently. These can present their findings/work as a technical report/document and publish their research articles in national and international level research journals.

Students, once they achieve the degree of masters in the areas of Remote Sensing and GIS technology, they can solve number of problems related to earth/geological sciences..

Program- Specific outcome

- Students after gaining the knowledge in the field of Geoinformatics can share theoretical and practical knowledge, which is required in teaching and research.
- Student can develop the ability to apply professional ethics, and accountability.

Semester	Paper Theory / Lab	Instruction hrs/Week Lectures / Practicals	Duration of Exams (hrs)	Marks			Credits
				IA	Exam	Total	
First Semester : Five Hard Cores and One Soft Core							
GI H401	Data Acquisition and Data Processing	4	3	30	70	100	4
GI H402	Remote Sensing and Photogrammetry	4	3	30	70	100	4
GI H403	Computer Science and Web Designing	4	3	30	70	100	4
GI P404	Remote Sensing and Photogrammetry (Lab H)	8	4	30	70	100	4
GIP405	Computer: (Software and Hardware) and	8	4	30	70	100	4

	Web Designing (Lab H)						
GIS 406	Fundamentals of Geological Science	3	3	30	70	100	3
					Semester Total	**600**	**23**
Second Semester : Two Hard Cores, Four Soft Cores and One Open Elective							
GIH 451	Data Base Management System and Spatial Statistics	4	3	30	70	100	4
GIH 452	Geographical Information System	4	3	30	70	100	4
GIS 453	Digital Image Processing	3	3	30	70	100	3
GIS 454	Applied Geomorphology	3	3	30	70	100	3
GIS 455	Geo Environmental Science	3	3	30	70	100	3
GIP 456	Geographical Information System and DBMS (Lab S)	6	3	30	70	100	3
GIE 457	Geo Informatics of Natural Resource (Open Elective)	3	3	30	70	100	3
					Semester Total	**700**	**23**
Third Semester : Two Hard Cores, Five Soft Cores and One Open Elective							
GIH 501	Water resources	4	3	30	70	100	4
GIH 502	Marine Geoinformatics	4	3	30	70	100	4
GIS 503	Cartography	3	3	30	70	100	3
GIS 504	Disaster Management	3	3	30	70	100	3
GIS 505	Applied Geo informatics	3	3	30	70	100	3
GIP 506	Digital Image Processing and Cartography (Lab S)	6	3	30	70	100	3
GIP 507	Water Resources and Marine Geoinformatics (Lab S)	6	3	30	70	100	3
GIE 508	Geo informatics of Coastal Environment (Open Elective)	3	3	30	70	100	3
					Semester Total	**800**	**26**
Fourth Semester :							
GI 551	Dissertation				200		
	Viva - Voce				80	280	
	Internal assessment						16
	Field Work				60		
	Field Report				60	120	
					Semester Total	**400**	**16**
					Grand Total	**2500**	**88**

FIRST SEMESTER

Course Outcome:

CO1: Students will understand the mechanism of data collection and information extraction, historical evolution and need for information, Basic Concepts of Spatial Data and a spatial data, spatial information

CO2: Spatial data: Vector and Raster data format. Advantage and disadvantage of vector data and Raster data

It is a basic component in computer science and GIS companies or teaching field in computer science.

GIH 401: DATA ACQUISITION AND DATA PROCESSING

Unit 1	**Definition** of data and information, historical evolution and need for information, Basic Concepts of Spatial Data and a spatial data, spatial information	06 hrs
Unit 2	**Primary data:** Map data, data from aerial photos, satellite data, surveys.	06 hrs
Unit 3	**Secondary data:** Source of secondary data, advantages and limitations of secondary data.	06 hrs
Unit 4	**Spatial data:** Vector and Raster data format. Advantage and disadvantage of vector data and Raster data.	06 hrs
Unit 5	**Extraction of data**: Data from Toposheets, aerial Photos, Satellite Data (Hard copy & Digital Data products, thematic maps)	06 hrs
Unit 6	**Data capture**: Digitization and Scanning, Digitization Tablet, Scanners-Flat bed Scanner, Drum Scanner, limitations of Scanned data	06 hrs
Unit 7	**Attribute Data:** Source of attribute Data (need, methodology and relevance), Data input, Data Storing and Data Structuring	06 hrs
Unit 8	**Analog and digital data**: introduction, analogue to digital data conversion, digital to analogue data conversion.	06 hrs

References

1. Avery T.E., and G.L.Berlin, 1985, Interpretation of Aerial Photographs, 4th Ed, Bergess, Minneapolis, Minn, 34-98.
2. Betnstein, R. 1978, Digital Image processing for remote Sensing, IEEb Press, New York, 26-64.
3. Bruno Marcolongo and Franco Mantovani, 1997, Photogeology,Remote sensing Applications in Earth science, Oxford and IBH Pub. Co Pvt. Ltd., New Delhi, 12-108.
4. Drury, S. A. 1987, Image Interpretation in Geology, Allan & Unwin (Publishers) Ltd, 23-67.
5. Kenneth R, Castle man, 1979, Digital Image Processing, Prentice Hall, 24-98.
6. Falls Church, 1980, Manual of Remote sensing Vol I and II, American Society of Photogrammetry, 4th Ed, 39-58.
7. Miller and Miller, 1961, Photogeology, Mc Graw-Hill Book Company, New York,.
8. P. M. Mather, Computer Processing of Remotely Sensed Images- An Introduction, John. Wiley and Sons, 1999.
9, Pandey S. N., 1987, Principles and Applications of Photogeology, Wiley Eastern,.
10. Ravi. P. Gupta, 1991, Remote Sensing Geology, Publisher- Berlin: Sprunger; Vela.
11. Reddy, A. M., 2006, Remote Sensing and Geographical Information Systems. BS Publications, 1-436.
12. Robert, H. Arnold., Interpretations of Air Photo and Remotely Sensed Imagery

GIH 402: REMOTE SENSING AND PHOTOGRAMMETRY

Course Outcome:

CO1: Students will gain knowledge in the field of remote sensing and photogrammetry. They willcome to know the history and concept of Remote Sensing, Electromagnetic Spectrum,Energy Interaction with atmosphere and earth surface features. Basic concepts of visible, Optical, Thermal (Infrared), and Microwave remote Sensing. Platforms and Sensors.

CO2: Students will learn pr**inciples and applications of Aerial Photography:**Aerial photo interpretation in resource evaluation – geology, delineation of geological structures, mineral exploration, geomorphology, geological structure.

Technologies not only to identify useful features, but also effects of natural processes and humans on the earth.

Unit 1	**Introduction:** History and concept of Remote Sensing, Electromagnetic Spectrum, Energy Interaction with atmosphere and earth surface features. Basic concepts of visible, Optical, Thermal (Infrared), and Microwave remote Sensing. Platforms and Sensors. **Optical Remote Sensing:** Principles of Optical remote sensing, spectral reflectance of earth's features in different Wavelength regions, multispectral concepts of remote sensing, Scanners, applications of optical Remote Sensing Indian Remote Sensing Programme and important Indian Satellites.	06 hrs
Unit 2	**Thermal Remote Sensing:** Principles of thermal remote sensing, black body, radiant temperature, radiation from Earth's objects, thermal conductivity, thermal capacity, thermal inertia, thermal diffusivity, Thermal Radiometers, scanners, calibration of scanners, mapping with Thermal scanners, Imaging Spectrometer, Application of Thermal Remote Sensing.	06 hrs
Unit 3	**Hyper Spectral Remote Sensing:** Introduction to Hyperspectral Remote Sensing Sensors/Imaging Spectrometers, Hyperspectral Satellite Systems, Hyperspectral Image Analysis Techniques including Correction.	06 hrs
Unit 4	**Microwave Remote Sensing & RADAR Remote Sensing***:* Concept and principles of Microwave Remote Sensing, SLAR, SAR and Scaterometer, Application of Microwave Remote Sensing. Outlines of Radar Image Interpretations. **Image Interpretation:** Visual and Digital Interpretation techniques - Basic concepts of visual interpretation, tone, color, texture, pattern, shape and contextual features. Digital Image Interpretation-	06 hrs
Unit 5	**Principles of Aerial photography; Geometry of aerial photography:**Fundamentals of photogrammetry and aerial photography: History, aerial cameras, aerial films and processing. Types of aerial photos. Fundamentals and geometry of aerial photographs, Scale, Advantages and disadvantages of small scale and large scale aerial photographs.	06 hrs
Unit 6	**Relief and tilt displacements,** mosaics and types of mosaics, stereoscopic vision and stereoscopes, image displacement due to relief, concepts of stereo-photogrammetry, normal vision, depth perception and vertical exaggeration.	06 hrs

Planning for aerial photographs, flight procedures, planning and execution of photographic flights, radiometric characteristics. Elements of aerial photo interpretation: tone, color, texture, pattern, shape, size and associated features, geotechnical analysis and convergence of evidence.

Unit 7 **Principles and Applications of Aerial Photography:** Aerial photo interpretation in resource evaluation – geology, delineation of geological structures, mineral exploration, geomorphology, geological structure. 06 hrs

Unit 08 Digital photogrametry and interpretation techniques: definition, creation of digital images, automatic measurements, automatic surface modeling, aerial triangulations, digital photogrammetric workstation 06 hrs

References

1. Avery T.E., and G.L.Berlin, 19085, Interpretation of Aerial Photographs, 4th Ed, Bergess, Minneapolis, Minn, 34-908.
2. Betnstein, R. 19708, Digital Image processing for remote Sensing, IEEb Press, New York, 26-64.
3. Bruno Marcolongo and Franco Mantovani, 1997, Photogeology, Remote sensing Applications in Earth science, Oxford and IBH Pub. Co Pvt. Ltd., New Delhi, 12-1008.
4. Drury, S. A. 19087, Image Interpretation in Geology, Allan & Unwin (Publishers) Ltd, 23-67.
5. Kenneth R, Castle man, 1979, Digital Image Processing, Prentice Hall, 24-908.
6. Lilliesand T.M. & Kiefer R.W. 1994, Remote Sensing and Image Interpretation, John Wiley &Sons,New York, 56-708.
7. Falls Church, 19080, Manual of Remote sensing Vol I and II, American Society of Photogrammetry, 4th Ed, 39-508.
8. Miller and Miller, 1961, Photogeology, Mc Graw-Hill Book Company, New York,.
9. P. M. Mather, Computer Processing of Remotely Sensed Images- An Introduction, John. Wiley and Sons, 1999.
10. Pandey S. N., 19087, Principles and Applications of Photogeology, Wiley Eastern,.
11. Ravi. P. Gupta, 1991, Remote Sensing Geology, Publisher- Berlin: Sprunger; Vela.
12. Reddy, A. M., 2006, Remote Sensing and Geographical Information Systems. BS Publications, 1-436.
13. Robert, H. Arnold., Interpretations of Air Photo and Remotely Sensed Imagery.
14. Robert, K. Vincent., Fundamentals of Geological and Environmental Remote Sensing.
15. Sabins, F.F., 19086, Remote sensing Principles and Interpretations, 2nd Ed. W.H. Freeman and Company, New York.
16. SchowengerdR .A. 1995 Techniques for Image processing and classification in Remote Sensing, Academic Press. New York.
17. Siegel, B.S. and Gillespie, A.R. 1994, (eds). Remote sensing and Image Interpretations, John Wiley and Sons, New York.
18. Swain P. H. Davis S.M. (Editor), 19708, Remote Sensing, The quantitative approach, McGraw, Hill Book co., New York,.
19. Thomas M. Lillesand and Raiph W. Kiefer., 2000Remote sensing and Image Interpretations, John Wiley and Sons, New York, , 4th Edition, 24-254.
20. Verbyla, D. 1995, Satellite remote sensing for natural resources; Lewis Publishers, Boca Rotaon, FL,.
21. Rees, W.G. 1990, Physical Principles of Remote sensing, Cambridge University Press.
22. Wolf, P. R. 19083, Elements of Photogrammetry, 2nd Ed, Mc Graw-Hill, New York.

GIH 403: COMPUTER SCIENCE AND WEB DESIGNING

Course Outcome:

CO1: They will learn about computers, development of computers, Hardware and Software.
CO2: Apply algorithmic, mathematical and scientific reasoning to a variety of computationalproblems related to geosciences.
CO3: Create Geodatabases and web pages
CO4: Identify the theoretical and methodological foundations of programming including C, C++ and Python.
CO5: Work on hands-on analytical skills in C, C++ software packages.
CO6: To relate computer science to geo-spatial applications
CO7: An ability to communicate effectively with a range of audiences
CO8: Image processing techniques from Computer Science to turn the data intoinformation.

Unit 1 **Basics of Computers:** An introduction to computers, development of computers, Hardware and Software. Fundamentals of Computers—operating systems, input devices, output devices, storage devices-primary, secondary, central processing unit, computer languages, translators. 08 hrs

Unit 2 **Information Super Highway:** Introduction to Internet. Scope of Internet. Equipment required for an Internet Connection. Electronic Mail. Concepts of Information Storehouse. Surfing the Net. Browsing the WWW. Search Engines and their applications. Application of internet to Geoinformatics. Introduction to networks, Local area network devices, topologies, protocols, wide area networks, servers, hubs, nodes, moderns, Internet. 08 hrs

Unit 3 **Web design:HTML:** Basic & advanced HTML, Types of tags, Document creations, Linking, Creating Link List, handling Images, tables and, style sheets. Types of tags, Creating hypertext links. Formatting the text (example). Creating Image Links. Outlines of Python. 08 hrs

Unit 4 **Microsoft Power Point:** Introduction to Microsoft Power Point. Functions and Exploring Power Point Views. Creating a Presentation. Delivering and Printing a Presentation. Animations and Slide Show applications to Geoinformatics 08 hrs

Unit 5 **Microsoft Excel:** Functions of Microsoft Excel. Starting Microsoft Excel. Excel Work Environment. Changing the Size of a Workbook and Excel Window. Cell and Cell address. Standard Toolbar. The Formatting Toolbar. The Formula Bar. Components of an Excel Workbook. Moving Data, Copying Data, Relative Cell Addressing, Absolute Cell Addressing. Formulas using Numbers. Simple graphs. Functions and Applications of Microsoft Excel to Geoinformatics. 08 hrs

Unit 6 Outlines of 'C' and Introduction to C++. 08 hrs

References

1. Beekman, G. 1999, Computer Confluence: Exploring Tomorrow's Technology. Addison-Wesley, Reading, MA. (3rd. ed).
2. Willis H. Means19087A content analysis of six introduction to computer science textbooks ACM New York, NY, USA, 403 - 413

3. Beekman, G. George Beckman 2000 Tech Nation. Online. Internet. [March 14,]. Available WWW:http://www.computerconfluence.com/about/tech.htm
4. Cheryl SchmidtComplete 19908, Computer Repair Textbook, Scott Jones, 22-408.
5. Dix, A., Finlay, J., Abowd, G., and Beale, R. 1999. Human-Computer Interaction. Prentice-5. Hall, Herts. UK. 67-089.
6. Goldberg, M. W. CALOS: Feb, 1997), First Results From an Experiment in Computer-Aided
7. Learning for Operating Systems, in Proceedings of the Twentyeighth SIGCSE Technical Symposium on Computer Science Education. ACM Press. 408-52.
8. Goldberg, M. W. WebCT and First Year Computer Science June, 1997: Student Reaction to and Use of a Web-Based Resource in First Year Computer Science, in Proceedings of the ACM's ITiCSE Conference on Integrating Technology into Computer Science Education. ACM Press. 127-129.
9. Shelly Cashman 2000, Course Technology. About Shelly Cashman Series. Online. Internet. [March 14,]. Available WWW: Http://www.scseries.com/about_sc.cf

GIP 404: REMOTE SENSING AND PHOTOGRAMMETRY (LAB H)

Course Outcome:

CO1: Students will be able to generate various kinds of thematic maps like geology, geomorphology, soil, landuse/land cover etc. They will carry out visual and digital analysis and extract the required information based on remotely sensed data.

Technologies not onlyhelpful to identify useful surface features, but also helps in understanding the natural processes.

Aerial mosaics, compilation, annotation, scaling and preparation of Photo index, Photo base determination and numerical problems on aerial photographs.

Spectral reflectance: Plotting of Spectral Reflectance Curves- Rocks, Soil, Vegetation and Water covering.

Visual Analysis: Study of aerial photographs under pocket and mirror stereoscopes and interpretation of satellite images (Black & White and FCC images)

Interpretation of satellite data Products and generation of thematic maps.

Elements of Aerial Photo: Study of Stereo pairs of aerial Photos. Flight planning, Determination of scale and slope. Outlines of parallax measurement.

GIP 405: COMPUTER: (SOFTWARE AND HARDWARE) AND WEB DESIGNING (LAB H)

Course Outcome:

CO1: Apply algorithmic, mathematical and scientific reasoning to a variety of computational problems related to geosciences.
CO2: Create Geodatabases and web pages
CO3: Identify the theoretical and methodological foundations of programming including C, C++ and Python.
CO4: Work on hands-on analytical skills in C, C++ software packages.
CO5: To relate computer science to geo-spatial applications
CO6: An ability to communicate effectively with a range of audiences
CO7: Image processing techniques from Computer Science to turn the data into information.

Introduction to Visual Basics. Use of Visual Basics. Applications of Visual Basics.

C programming: character set, data types, variable constants, operators: arithmetic, logical, bitwise, special operators in C

C# Programming:C# Basics, Implementing OOP concepts in C#, Properties, Indexers, Delegates and Events, Windows Forms Basics, Windows forms Controls, Debug, Test, Exception Handling, Assemblies and Reflection, Threading Array list and collections, File Handling in C#.

C ++ Programming: Basics of C++, Tokens , Expressions, control structures, Functions of C++, Classes & Objects, Constructors & Destructors, Operator Overloading and type Conversions, Inheritance: Extending Classes, Pointers, Virtual Functions, Polymorphism, Object Oriented Systems & Development, New Features of Ansi C++ Standard

Oracle: Physical and logical structuring in Oracle Queries
SPSS: Introduction to SPSS. Use of SPSS in creating a data base. Application of SPSS in Correlation Co-efficient. Use of SPSS in Linear Regression,

Modelling and Prediction. Application of SPSS in GIS data modelling.

Application of Java to Geoinformatics data.
Introduction to WEB and its Applications in Geoinformatics.

GIS 406: FUNDAMENTALS OF GEOLOGICAL SCIENCE

Course Outcome:

CO1:. Students from different disciplines will come to know the fundamental concepts of Geology and Geological processes.

CO2: Mineralogy: Introduction to Rock forming Minerals They will learn about formation of the earth, composition of earth crust, mantle core, plate tectonics Major and Minor plates, continental drift, ocean floor spreading.

CO3: Outlines of Igneous Rocks: Granites, Basalts, Dolerite, Andesite etc. **Structural Geology:** Primary and Secondary Structures. Folds, Faults, Joints & Unconformities

Unit 1	**Introduction,** Formation of the earth, composition of earth crust, mantle core, plate tectonics Major and Minor plates, continental drift, ocean floor spreading.	08 hrs
Unit 2	Mineralogy: Introduction to Rock forming Minerals	08 hrs
Unit 3	Outlines of Igneous Rocks: Granites, Basalts, Dolerite, Andesite etc.	08 hrs
Unit 4	Outlines of Metamorphic Rocks: Gneiss, Schist, Quartzite, Granulites, Marble, Slate, etc.	08 hrs
Unit 5	Outlines of Sedimentary Rocks: Origin of sediments. Breccia, Conglomerate, Sandstone, Limestone, Shale Morphology & Origin of Laterites.	08 hrs
Unit 6	**Structural Geology:** Primary and Secondary Structures. Folds, Faults, Joints & Unconformities.	08 hrs

References

1. Mukerjee, P.K. 1997, A Text book of Geology. The World Press Pvt. Ltd, 1-6308.
2. Allen, J. R. L, 1969. Physical Processes of Sedimentation; New York, American Elsevier, 3-36.
3. Straller, A. N. 1976, *Principles of Earth Sciences*, Harper & Row, 269-315.
4. Moorbath, S. 1977. The Oldest Rocks and the Growth of Continents. *Scientific American*, 236-3, 92-104.
5. Wilson, J. T. 1963, Continental Drift. *Scientific American*, 2008-4, 086-100.
6. Head, J. W., C. A. Wood, and T. A Mutch. 1977, *Geological Evolution of Terrestrial Planets*, 65-19-21.
7. Reinick, H. E and Singh, I. B. 1973, *Depositional Sedimentary Environments*, Springer-Verlag, England, 3-435.
8. Linslay R. K, Kohler, M. A. and Paul Hus J. L. H. *Hydrology for Engineers*. McGrow Hill, New York, 23-244.

9. Christopherson, R. W., 1995, Elemental Geosystems. Prentice Hall, New Jersey, 3-540.

10 Hyndman, D. W., 1972. *Petrology of Igneous and Metamorphic Rocks*. McGrow Hill, New York, 31-404.

11 Windley, B. F. *The Evolving Continents*, John Willey & Sons, 1-3085.

12 Ramsay, J.G. (1967) Folding and Fracturing of Rocks - McGraw Hill Book Co
13. Billings M.P. (1977) Structural Geology – 3rd edition, Prentice Hall
14. John Wiley & Sons - Davis, G.H. Hall (1984) Structural Geology of Rocks and Regions
15. Hatcher, Robert D. (1995) Structural Geology Principles, Concepts and Problems, 2nd Edition, New Jersey Prentice
16. W.H. Freeman, New York - Twiss, Robert J. (1992) Structural Geology
17. McGraw Hill - Timothy Whetten (1975) Structural Geology

SECOND SEMESTER

GIH 451: DATA BASE MANGEMENT SYSTEM AND SPATIAL STATISTICS

Course Outcome:

CO1: Develop Geodatabases to store spatial data and implement these in a range of application areas.
CO2: Address the real world problems related to geosciences using programming.
CO3: Apply knowledge of computing, mathematics and Geoinformatics appropriate to the application area.
CO4: Analysis of geospatial data using statistical procedures and SPSS software.
CO5: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

DATA BASE MANAGEMENT SYSTEM

Unit 1	**Data and database**: Organization of database Components of Database Management Systems Files: key, file directories and file storage. Data retrieval and Data Security Basics of Database models: Entity-relationship model, Flat File system, Network Data model. Concept of Data Mining and Data Warehousing.	06 hrs
Unit 2	**Structured Query Language (SQL).** Structured Query Language (SQL), Query by Example (QBE) Relational Model Concepts, Relational Algebra, Record Storage & Primary File Organization, Buffering of Blocks, Hashing Techniques, Index Structures for Files. Transaction Processing Concepts, Database Recovery Techniques, Data base Security Authorizations, Functional Dependencies and Normalization for Relation Databases, Normal Forms Based on Primary Keys, Boyce – Codd Normal form.	06 hrs
Unit 3	**Relational and Hierarchical Data Models:** Basic definition & terminology, Projection operators, Selection operators (Arithmetic & Logical operators), Set unions, Set differences, Cartesian product, Brief description of ASP,NET, JAVA and ORACLE.	06 hrs
Unit 4	**SPATIAL STATITICS** **Measures of Central Tendency:** Mean, Median and Mode and their application to GIS and Remotely Sensed Data.	06 hrs
Unit 5	**Correlation Co-efficient** and its application to GIS and Remotely Sensed Data. **Linear Regression and Prediction:** Concepts and application to GIS and Remotely Sensed Data.	06 hrs
Unit 6	**Cluster Analysis:** Introduction to Cluster Analysis. Interpretation of Q-mode and R-mode Clusters with reference to Spatial Data. Application of Cluster Analysis to Spatial Data.	06 hrs
Unit 7	**Factor Analysis:** Outlines of Factor Analysis. Interpretation of Factors for Spatial data	06 hrs
Unit 08	**Statistical Package: SPSS** Introduction to Statistical Packages. Introduction to SPSS package. Functions of SPSS. Graphic out-put of processed data using SPSS. Application of SPSS to Geoinformatics. Case studies using SPSS. Use of SPSS in spatial data analysis. Designing of Cluster Analysis and Dendrograms related to Geoinformatics data. .	06 hrs

References

1. K. Majumdar & Bhattacharya. P, 1999, *Database management Systems*. Tata McGraw-Hill Publications.
2. Korth H. F &Silberschatz, A. 19086, *Database Systems Concept* , McGraw-Hill, New York
3. Widerhold G, 19084, *Database Design* ,McGraw-Hill, New York
4. Martin. J, 1977, *Computer Database Organization*, Prentice-Hall, New Jersey.
5. Sir Maurice Kendall., Alan Stuart and J. Keith., *The Advanced theory of Statistics*, Vol 3, 4th Edition (1943-1960)
6. Daniel and S. Wilks, 1995, *Statistical Methods in the Atmospheric Sciences*.
7. Gupta, S. C., 1977.*Fundamentals of Applied Statistics*. Vol 62, No. 3,
8. Elhance Veena Elhance D. N. and Aggarwal B. M. 1956-1996, *Fundamental of Statistics*.
9. Davis, J. C. 1973.*Statistics and Data Analysis in Geology*.
10. Krumbein, W. C and Graybill, F. A. 1965.*An Introduction to Statistical Models in Geology*.

GIH 452: GEOGRAPHICAL INFORMATION SYSTEM

Course Outcome:

CO1: Basics of Geographic Information System: Definition, components, packages, capabilities and purpose of GIS. History of Geographic Information System, Development of GIS as an information and decision making system, Application of GIS in India

CO2: GIS Data and Analysis: Spatial Analysis, Classification, Overlay, Polygon Neighborhoods, Data analyzing operations in GIS, Buffering and neighboring functions , integrated data, raster and vector overly method, problems of vector and raster overlay, spatial interpolation, GIS for surface analysis and network analysis.

Jobs in many Govt. agencies like ISRO, IIRS, NRSA, WIPRO and lot of private companies. They can join for teaching field in degree colleges or engineering colleges

Unit 1	**Basics of Geographic Information System**: Definition, components, packages, capabilities and purpose of GIS. History of Geographic Information System, Development of GIS as an information and decision making system, Application of GIS in India.	06 hrs
Unit 2	Definition- Maps and spatial information, Components of GIS, maps and spatial data- Thematic characteristics of spatial data, other sources of spatial data- sensors, survey data, air photos, satellite images and field data.	06 hrs
Unit 3	Spatial and attribute data, spatial entities, raster and vector spatial data structure, comparison of raster and vector methods, linking spatial and attribute data.	06 hrs
Unit 4	Digitization, Editing and Structuring of Map Data: Mode of digitization, editing, topology creation and structuring map data. Data Quality and Sources of Errors: Nature of geographic data, sources of errors in GIS database, data quality parameters, handling errors in GIS.	06 hrs
Unit 5	**GIS Data and Analysis:** Spatial Analysis, Classification, Overlay, Polygon Neighborhoods, Data analyzing operations in GIS, Buffering and neighboring functions , integrated data, raster and vector overly method, problems of vector and raster overlay, spatial interpolation, GIS for surface analysis and network analysis.	06 hrs
Unit 6	**Concepts of 3D models:** Digital Elevation and Terrain Models (DEM & DTM), Generation and structure of DEM/DTM and their applications. Geospatial Triangulated Irregular Network (TIN) model, slope, aspect, hillshade.	06 hrs
Unit 7	Fundamentals of GPS- Introduction, space segments, user segments and control segments, observation principle and signal structure, accuracy of GPS measurements, point positioning and relative positioning, methods of surveying with GPS, Static and Kinematic positioning, navigation with GPS, differential GPS, navigational receivers.	06 hrs

Unit 8 **GIS Modeling:** Cartographic models, Inductive and Deductive Models, Model Flow Charting, Model Implementation and Verification. 06 hrs

Principles of Design and GIS Output, GIS Project design and Management.

References

1. Bonham – Carter G.F., Geographic Information System for Geoscientists, Pergamon Press, Tarrytown, New York, 1994.
2. Burough, P.A., and Rachael A, Mec Donnell. Principles of Geographic Information System., Oxford Unversity Press-19908 (Indian Print).
3. Demers, Michael; Fundamental of Geographic Information System, John Wiley, 1999 (Indian Print)
4. Fraser Taylor., P.A., Geographic Information System – The Microcomputer and Modern Cartography, Pergamon Press, 1991.
5. Heywood, Carnelin and Carven, An Introduction to Geographic Information System by, Prentice Hall, 1998.
6. Keaies, J.S. Cartographic design and Production London, Longman group, 1973.
7. Les Worell, (Ed) 1990. Geographic Information System, Development and Applications, Belbaven Press.
8. Longley, P. A., Maguire, D. J., Goodchild, M. F and Rhind, D. W; GIS Principles Techniques ,Applications and Managements, Longman Scientific and Technical, 2001 (very Expensive Book).
9. Maguire, D. J. Goodchild, M. F., and Rhind, D. W. GIS- Principles and application, Longman Scientific and Technical, 1991.

GIS 453: DIGITAL IMAGE PROCESSING

Course Outcome:

CO1: Digital Image processing involves the manipulation and interpretation of digital imagesacquired by satellites, with the help of a computer.

CO2: Students will carry out the analysis of Digital images, Sources of errors; Image Pre-processing-Atmospheric, Geometric and Radiometric corrections, Noise removal, Resampling techniques. Image Enhancement Techniques.

They will be exposed to various image processing software like ERDAS IMAGINE, ENVI, EASI PACE, ARC GIS etc.

Unit 1	Introduction: Digital images, Sources of errors; Image Pre-processing-Atmospheric, Geometric and Radiometric corrections, Noise removal, Resampling techniques. Image Enhancement Techniques. Contrast enhancement: Linear and Non-Linear Logarithmic contrast enhancement, edge enhancement, density slicing, principal component analysis; IHS Transformation, Spatial filtering, Low frequency and high frequency band ratioing and band combination etc.	06 hrs
Unit 2	Image and Digital Images, types of images and acquisition, simple image model, Sampling and reconstruction, uniform sampling and quantization	06 hrs
Unit 3	**Digital Image Analysis:** Digital data, Image File formats, Image Rectification and Restoration, Radiometric, Atmospheric and Geometric Corrections.	06 hrs
Unit 4	**Image enhancement techniques:** Raw, Processed Images, Contrast Manipulation, Spatial feature Manipulation, Multi-Image Manipulation.	06 hrs
Unit 5	**Contrast Manipulation:** Grey Level Thresholding, Level Slicing, Contrast Stretching- Concept of Digital Number.	06 hrs
Unit 6	**Spatial feature Manipulation:** Convolution, Edge Enhancement, Concept and Use of Fourier Analysis in Digital Image Analysis.	06 hrs
Unit 7	**Multi-Image Manipulation: Spectral** Ratioing, Principle and Canonicle Components, Vegetation Components-TVI & NDVI.	06 hrs
Unit 08	**Digital Image Classification:** Classification scheme; Supervised classification, Training sites selection and statistical information extraction; Discriminant functions; Maximum Likelihood classifier, Euclidian distance, Mahalanobis distance; Unsupervised classification, classification accuracy assessment, Error Matrix.	06 hrs

References

1. Bracewell ,R.o 919780 the fourier transform and its application 2nd edition Mc Grew-hill NY
2. Duda, R.o. and Hart p.E. (1973) pattern Classification and Scene analysis. Wiley
3. Fu, K.S. 91974) Systactic Method in pattern recognition. Academic,.
4. Drury, S. A. 1987, Image Interpretation in Geology, Allan & Unwin (Publishers) Ltd, 23-67.
5. Kenneth R, Castle man, 1979, Digital Image Processing, Prentice Hall, 24-98.
6. Lilliesand T.M. & Kiefer R.W. 1994, Remote Sensing and Image Interpretation, John Wiley &Sons,New York, 56-78.
7. SchowengerdR .A. 1995 Techniques for Image processing and classification in Remote Sensing, Academic Press. New York.
8. Siegel, B.S. and Gillespie, A.R. 1994, (eds). Remote sensing and Image Interpretations, John Wiley and Sons, New York.
9. Remote sensing and GIS B Bhatta oxford university press.

GIS 454: APPLIEDGEOMORPHOLOGYANDGEOENVIRONMENTALSCIENCE

Course Outcome:

CO1: Understand Earth's surface processes, relief configuration, landscape evolution, and subsurface composition.
CO2: Identify different landforms and its processes.
CO3: Use remote sensing and GIS for mapping of geomorphological characteristics of landforms

Unit 1	**Concepts of Modern Geomorphology**: Geomorphology and its applications in Natural resources inventory. Geomorphology and its applications to Geoinformatics.	08 hrs
Unit 2	**Geomorphic Environments:** The Fluvial Systems. Coastal and Marine geomorphology. Aeolian, Glacial, Karst and Dune Environments. M.O. Ridges, Ocean floor Topography.	08 hrs
Unit 3	GeomorphologyandGISinexplorationofthenaturalenvironment.ImpactofSlope, badlands, Pediments, Streams in geomorphic evolution. Geomorphic controls on the groundwater resources of Coastal, Island and hinterland terrains. Geomorphological factors to be considered while selecting the solid waste disposal sites. Solid waste management and its impact on local and regional geomorphology..	08 hrs
Unit 4	Geohazards and geomorphic controls. Application of Remote Sensing and GIS in quantitative and Quantitative interpretations of 'risk area mapping' including forest fires, floods, earthquakes and Tsunami effected terrains.	08 hrs
Unit 5	**General Introduction**: Definition of Environmental, Environmental Pollutant, Environmental Pollution, Environment–Handling, Hazardous substance.	08 hrs
Unit 6	**Environment Management Plan**: Concepts and use of EMP in coastal and marine environments **Environment Impact Assessment Act**: Definition, use and implementation for specific areas such as Marine Environments, Ports, Harbours, Recreation, Water Quality Standards for class SW-I waters, SW-II, SW-III, SW-IV, SW-V.etc., NoiseStandards.	08 hrs
Unit 7	**Coastal Regulation Zones**: Concept of coastal Regulation Zones. Classification of Zones, Criteria of Zonation and Evolution of CEZ norms. Application of cartography, Remote sensing and GIS in mapping of Coastal Regulation Zones.	
Unit 8	**Anthropogenic and Natural environmental Hazards**: Reconnaissance mapping of Landslides and use of DEM. Use of GIS and Remote sensing in detection of water – spread areas including monitoring flood scenarios. Use of IKONOS and other digital data products in assessing damage due to earthquakes, Forestfires, flooding, etc. Impacts of Open-cast Mining and monitoring through multi-dated Remote Sensing and GIS techniques.	

References

1. Fundamentals of Photogeology, Geomorphology – Verstappen – TTC Holland.
2. Thornbury,W. D., 2004, Principles of Geomorphology, CBS Publ., 5-570.
3. Wathern, P 1988, EIA: Theory & Practice. Unwin Hyman, London, 1-17.
4. Wood, C. 1995 EIA: A Comparative Review. Longman. 87-255.
5. Pethick, J. 1984. An introduction to Coastal Geomorphology, Edward Arnold, London, 259p.
6. Ritter, D.F., R.C. Kochel and J.R. Miller (2011) *Process Geomorphology, 5th edition*. McGraw Hill, NY. Rental text.
7. Summerfield, M.A. (Editor), 1991. Global Geomorphology: An introduction to the study of landforms, John Wiley and Sons Ltd., New York: 560p.
8. Thornbury, W.D. (1969): Principles of Geomorphology, Wiley Eastern Limited, New Delhi: 594 p.
9. Tinkler, 1985. A short history of Geomorphology, Croom-Helm, London.
10. Rice (1998): Fundamentals of Geomorphology.
11. Kale & Gupta (2001): Introduction to Geomorphology.

GIS 455: GEO ENVIRONMENTAL SCIENCE

Course Outcome:

CO1: Students will understand the basics of Environment, Environmental Pollutant, Environmental Pollution, Environment-Handling, Hazardous Substance, Occupier-Control of factory premises etc., Prescribed-Rules and Acts.

CO2: Anthropogenic and Natural Environmental Hazards: Reconnaissance mapping of Landslides and use of DEM. Use of GIS and Remote Sensing in detection of Water-spread areas including monitoring flood scenarios. Use of IKONOS and other digital data products in assessing damage due to earthquakes, Forest Fires, flooding, etc. Impacts of Open-cast Mining and monitoring through multi-dated Remote Sensing and GIS techniques.

Unit 1	**General Introduction**: Definition of Environment, Environmental Pollutant, Environmental Pollution, Environment-Handling, Hazardous Substance, Occupier-Control of factory premises etc., Prescribed-Rules and Acts.	08 hrs
Unit 2	**Environment Protection Rules**: History and Evolution. EIA in the UK., The Netherlands, New Zealand, Canada, USA. The European Directive on EIA. Scoping of Impacts, EIA Report Preparation, EIA Report Review, Decision Making. Mitigation of Impacts. **Rapid Environment Impact Assessment Act:** Definition and use and implementation.	08 hrs
Unit 3	**Environment Management Plan**: Concept and use of EMP in coastal and marine environments.	08 hrs
Unit 4	**Environment Impact Assessment Act:** Definition, use and implementation for specific areas such as Marine Environments, Ports, Harbours, Recreation, Water Quality Standards for Class SW-I Waters, SW-II, SW-III, SW-IV, SW-V. etc., Noise Standards.	08 hrs
Unit 5	**Coastal Regulation Zones:**Concept of Coastal Regulation Zones. Classification of Zones, Criteria of Zonation and Evolution of CRZ norms. Application of Cartography, Remote sensing and GIS in mapping of Coastal Regulation Zones.	08hrs
Unit 6	**Anthropogenic and Natural Environmental Hazards:** Reconnaissance mapping of Landslides and use of DEM. Use of GIS and Remote Sensing in detection of Water-spread areas including monitoring flood scenarios. Use of IKONOS and other digital data products in assessing damage due to earthquakes, Forest Fires, flooding, etc. Impacts of Open-cast Mining and monitoring through multi-dated Remote Sensing and GIS techniques.	08 hrs

References

1. Ahmad, Y. J and Sammy, G. K 1985 Guidelines to Environmental Impact Assessment in Developing Countries. Hodder &Stoughten, London. 26-82.
2. Anonymous, 1992. Overseas Development Administration-manual of Environmental Appraisal. ODA, London- II Edition. 8-16.
3. Anonymous, 1993. NATO-Methodology, Evolution and Scope of EIA, Report 197, NATO Brassiles, 3-12.
4. Beanlands G. E. &Dunniker, P. N 1984 An Ecological Frame work for Environmental Impact Assessment, Journal of Environmental management. 18:267-277.
5. Meenakshi, P., 2006, Elements of Environmental Science and Engineering.Printice Hall. 2-307.
6. Murthy, K. S. 1988. National Environmental Policy Act (NEPA) Process. CRC Press, Boca Raton USA, 1-18.
7. Ortolano, L. 1993. Control on Project Proponents and EIA Effectiveness. The Environmental Professional, Vol. 15:350-**363.**

GIP 456: GEOGRAPHIC INFORMATION SYSTEMS AND DBMS (LAB S)

Course Outcome:

CO1: The knowledge gained in the field of GIS can be used to integrate various kinds of spatial and non spatial data.

CO2: They will get jobs in many Govt. agencies like ISRO, IIRS, NRSA, WIPRO and lot of private companies of GIS in Bengaluru and Mangalore. And also can join teaching field in degree or engineering colleges

Georeferencing – image rectification based on co-ordinate system. Onscreen digitization

GIS and Remote Sensing data integration: Integration of vector and raster data (linking of spatial and non - spatial data)

Extraction of Thematic maps: preparation of thematic layers-onscreen from toposheets, images- Road, Settlement, Drainage, LULC

Map composition and presentation of results Overlay and proximity analysis- clip, erase, intersect, union, buffer

Edge matching/ spatial adjustment Calculation of slope in degrees and percentages. Calculation of area, perimeter and distance using ArcGIS

Creation of 3D maps: TIN, Hillshade, slope, Aspect with ArcGIS

Outlines of DBMS and Application of DBMS in Geoinformatics.

Introduction to SQL and its application in Geoinformatics. SQL Queries (Alter, Insert, Update, Delete).

Outlines of Visual Basics 6 and application with data storage in Geoinformatics.

GIE 457: GEOINFORMATICS OF NATURAL RESOURCES (OPEN ELECTIVE)

Course Outcome:

CO1: Student will understand the basic of Geoinformatics (RS, GIS, GPs, and Computer Application) and how best this technology can be effectively used in natural resources mapping/inventory.

CO2: Geoinformatics and other Information Sciences. Geoinformatics-Spatial and Non – Spatial data Management. Spatial information Technology

Unit 1	**Definition** of data and information, historical evolution and need for information, Basic Concepts of Spatial Data and a spatial data, spatial information. sources of spatial data- survey data, air photos, satellite images and field data	6 hrs
Unit 2	Scope and Importance of Geoinformatics; Basic concepts of remote sensing; aerial photography and satellite remote sensing. Indian Space Program and Indian remote sensing satellites	6 hrs
Unit 3	**Principles of Thermal and Microwave Remote Sensing:** Introduction, Black body radiation, Temperature Radiations from the earth's surface, Applications of thermal remote sensing. Basic concepts of microwave remote sensing, Real Aperture Radars and Synthetic Aperture Radars, Microwave sensors, Interferometry. Applications of Microwave Remote Sensing. Visual and digital image analysis techniques.	6 hrs
Unit 4	Map Concept: Map features, scale, resolution, accuracy, projection and database extent. Map Projection and parameters: Geographical co-ordinate system, spheroid and spheres. Types of projection and parameters. Indian geodetic system and Everest spheroid, world geodetic system -084 (WGS-084)	6 hrs
Unit 5	Geographic Information System: Definition, components, packages, capabilities and purpose of GIS. Data Models: Spatial and non-spatial databases. Vector and Raster models. Applicationand limitations of GIS	6 hrs
Unit 6	Fundamentals of GPS- Introduction, space segments, user segments and control segments, observation principle and signal structure, accuracy of GPS measurements, point positioning and relative positioning, methods of surveying with GPS, Static and Kinematic positioning, navigation with GPS, differential GPS, navigational receivers	6 hrs
Unit 7	Geoinformatics and other Information Sciences. Geoinformatics-Spatial and Non –Spatial data Management. Spatial information Technology	6 hrs
Unit 8	Applications of Geoinformatics: Geoinformatics technologies and the technologies used in Geographical Studies.	6 hrs

References

1. Goodchild M.F. and Kemp K – 'Developing a curriculum in GIS: The NCGIA Core Curriculum Project', University of California, Santa, Barbara 1990.
2. Ian Haywood Cornelius and Steve Carver – An introduction to GIS, Longman, New York, 2000.
3. Misra HC – A Handbook on GIS, GIS India, Hyderabad, 1995.
4. Smith T.R. and Piquet, GIS, London Press, London, 19085.
5. Taylor DRF – GIS: The Micro computer and Modern Cartography, Pergamon Press, Oxford, 1991.
6. Heywood I, et al, An Introduction to Geographical Information System,
7. Longman, New Delhi, 19908.
8. 7. Lo CP & Young AKW, Concepts & Techniques of Geographical Information
9. Prentice Hall of India, New Delhi – 2003.

THIRD SEMESTER

GIH 501: WATER RESOURCES

Course Outcome:

CO1: Water resources are the important natural resources and the knowledge of river basins, their catchments, geology and geomorphology will help to manage the water resources in a sustainable manner.

CO2: Application of Remote sensing and GIS in the study of Water Resources. Visual and Digital techniques in Water Resources Investigations. Selection of appropriate software and Data products useful in Water Resource

Unit 1	**Water Resources.** Introduction- Concepts of Surface Water, Hydrological Cycle. World water distribution, watershed management.	06 hrs
Unit 2	**Remote sensing and GIS in Water Resources.** Application of Remote sensing and GIS in the study of Water Resources. Visual and Digital techniques in Water Resources Investigations. Selection of appropriate software and Data products useful in Water Resource	06 hrs
Unit 3	**Hydrogeomorphic studies in Water Resources** Theory of Geomorphic Controls of Water Resources, Concept of Basin Network Analysis. Surface Runoff, Slope Analysis, Application of DEM in Water Resources, Flood mapping, Quantitative studies of drainage basins.	06 hrs
Unit 4	**Groundwater** Concepts of Ground water, Vertical Distribution of Groundwater, Types of Aquifers, Rock Properties Affecting Groundwater Resources, Lineament studies in Water Resources Groundwater Resources of India, Groundwater Resources of Karnataka	06 hrs
Unit 5	Theory of Groundwater flow- Darcy's law and its applications. Groundwater potential assessment, groundwater prospect zones mapping and groundwater information system.	06 hrs
Unit 6	**Water Resources and Watershed Management** Concept of River Basin Management, GIS applications in water resources development and management. Concept of Natural Recharge, Concepts in Artificial Recharge, Use of DEM in Recharge.	06 hrs
Unit 7	**Groundwater development and management:** Planning and management of groundwater. Methods of artificial groundwater recharge; rainwater harvesting, problems of over-exploitation of groundwater; water management in rural and urban areas, geological and geophysical methods of groundwater exploration	06 hrs

Unit 8 **Water Quality** Physical and chemical properties of water, quality criteria for different uses, groundwater quality provinces of India, Groundwater contamination. 06 hrs

References

1. David K. Todd, 1980, Groundwater Hydrology, John Wiley & Sons, 5-85.
2. Keith, P. B, 1973. Thompson et al (ed) Remote Sensing Water Resources Association, Urban Illineis, 27-86.
3. Linsley, Kohler and Paulhus, 1956, Hydrology for Engineers, Mc Graw-Hill, 56-74.
4. Ragunath, H. M. 1987, Ground Water 2nd ,Wiley Eastern, 23-65.
5. Subramanian, V. 2002, Water: Quantity-Quality Perspectives, in South Asia. Kingston Intl. Publishers, 34-57.
6. T. M. Lillesand and R. W. Kiefer, 2000, Remote Sensing and Image InterpretationJ.Wiley& Sons, 37-66.
7. Thomas G. Lane, 2000, Arc View 3D Analyst, ESRI, Press, 12-43.
8. Murthy, K.S. 1998. Watershed management in India, 3rd edition, Wiley Eastern Ltd.New Age International Ltd, New Delhi, 198 p.
9. Groundwater – C. F. Tolman – McGraw-Hill Book Co. Inc.
10. Groundwater Hydrology (2nd Ed.) – D. K. Todd, John Wiley and Sons Inc. New York
11. Hydrology – S. N. Davis and R. J. M. Dewiest – John Wiley and Sons Inc. New York.
12. Groundwater Resources Evaluation-W.C. Walton- McGraw-Hill Book Co. New York
13. Hydrogeology (2nd ed.) – C.W. Fetter – Merrill Publishing Co. U.S.A.
14. Handbook of Applied Hydrology-V.T.Chow (Ed) – McGraw-Hill Book Co. New York
15. Hydrogeology – K. R. Karanth – Tata McGraw Hill Publishing Co. Ltd.
16. Ground Water Assessment, Development and Management – K. R. Karanath – Tata McGraw Hill Publishing Co. Ltd.
17. Groundwater – H. M. Raghunath – Wiley Eastern Limited
18. Hydrology – H. M. Raghunath – Wiley Eastern Limited
19. Elements of Hydrology – V. P. Singh
20. Engineering Hydrology – K. Subramaniam – Tata McGraw Hill Publishing Co. Ltd.
21. Introduction to Hydrology – Viessman, W., Lewis, G. L. and Knapp, J. W. (3rd ed.) Harper and Row, New York

GIH 502: MARINE GEOINFORMATICS

Course Outcome: Students will be exposed to Coastal and Marine Environments, Classification of Coastal and Marine Environments.

CO1: So many central Govt. jobs like CGWB, Hydrochemistry in UPSC, similarly mines and Geology Dept. (MGD), in Karnataka, Work with National Disasters Management agency and also private agencies for Groundwater detection teaching filed in both degree of Engineering College
CO2: Understand various marine environments and its processes.
CO3: Knowledge and confidence to work in the multidisciplinary field of marine science.
CO4: Understand the concepts like coastal management, environmental modelling, geographic information science, ecological statistics, remotely sensed data analysis and marine and coastal law like Coastal Regulation Zones (CRZ).
CO5: To solve real-world problems, and learn to tackle multifaceted problems concerning our coasts and the ocean.
CO6: Understand theoretical and applied skills to connect.
CO7: Marine processes and the challenges that is associated with managing such a dynamic environment.
CO8: Monitoring of coastal and marine environment using remote sensing and GIS techniques.
CO9: Know the life under the sea to understand how life develops, interacts, and adapts to its environment.
CO10: Apply the knowledge of biology, chemistry, physics, geology, geophysics and the application of mathematics, engineering science as well as use computers for their work

Unit 1	**Introduction:** Introduction to Coastal and Marine Environments, Classification of Coastal and Marine Environments.	06 hrs
Unit 2	Introduction to Remote Sensing and GIS to Oceanography and Environmental studies. Data products and their acquisition	06 hrs
Unit 3	**Coastal Environment:** Concepts of Zonation, Rocky Shores, Sandy Shores, Cuspate Beaches, Spits and Beach Ridges, Back Shore Dune Environments,	06 hrs
Unit 4	**Marine Environment:** Mangrove Environments, Island Environments, Tidal Flat Environments, Intertidal Environments. Major Currents of the Oceans. Currents in Indian Ocean	06 hrs
Unit 5	**Satellite Oceanography:** History of Oceanographic Satellites. Satellites and their payloads for the retrieval of various coastal parameters. Technical Characteristics of Oceansat I & OCM/MSMR.	06 hrs
Unit 6	Outlines of Retrieval of Chlo-a; Dissolved organic substances and Total Suspended Matter. In situ recovery of Chlorophyll, SST, Wind Speed, Sea Surface Currents, Salinity, and TSM. Concepts of Biophysical Coupling. Prediction models of Sea Surface Temperature	06 hrs

Unit 7 **Applied Oceanography**: 06 hrs

Satellites and their payloads useful for ocean related studies. Satellite Oceanography and GIS to identify Potential Fishing Zones. Use of GIS and Cartography to Map Morpho-ecosystems of the Coast.

Unit 08 Use of Cartography, GIS and Satellite Oceanography in site selection of Major and Minor Ports and Beach Recreational Environments. 06 hrs

References

1. 1. Andy Mitchell, The *ESRIGuide to GIS Analysis,* Vol 1. ESRI Press. 11-21.
2. Balasubramanian, A. *Ecology Environment & Pollution,* Indira Publishers, Mysore.11-
   17.
3. Castro, P., and Huber, M. H., 1997, *Marine Biology*, McGraw-Hill. 19-080.
4. Das, P.K. *The Monsoons*, Natl. Book Trust. 9-21.
5. Howard, A. D. and Irwin Remson, *Engineering Geology in Environmental Planning.* McGraw-Hill publ. 33-42.
6. Keda and Dobson, 1995, O*ceanographic Applications of Remote Sensing*. CRC Press. Tokyo.131-367.
7. Michael Zeiler, *Modelling Our World*: The ESRI Guide to Geodatabase Design.
8. ESRIPress.24-31.
9. Pinnet, P., 1992, *Oceanography: An Introduction to the Planet Oceans*. West Publ. Co., 57-513.
10. Richard A. Geyer, *Marine Environmental Pollution*, Elsevier Oceanography Series.21-32.
11. Thomas G. Lane., *Arc View -3D Analyst*. ESRI, Press.13-22.

GIS 503: CARTOGRAPHY

Course Outcome: Students will learn the techniques of map generation.

CO1: Cartography knowledge is required to generate the topographical maps / base maps. Cartographer can generate different kinds of thematic maps.

CO2: Introduction to Cartographic themes. Cadastral and Chorographical Maps. Representation of Choroschematic maps, and Chorochromatic maps. Concepts of Hydrogeomorphic Maps. Introduction to Population diffusion and the importance of Dot and Multi Dot maps.

Unit 1 **Introduction to Cartography** 08 hrs

Ancient Cartography: Evolution of Cartography, Modern Cartography and Applications, Definition of Maps. Outlines of Map Projections.

Unit 2 **Cartographic Themes and Types of Maps** 08 hrs

Introduction to Cartographic themes. Cadastral and Chorographical Maps. Representation of Choroschematic maps, and Chorochromatic maps. Concepts of Hydrogeomorphic Maps. Introduction to Population diffusion and the importance of Dot and Multi Dot maps

Unit 3 **Topographic Maps:** Introduction to Topographic Maps. Spatial Information and Marginal Information of Topographic maps. Recovery of Spatial Information from Topographic Maps. Concept of 'Central Theme' and examples. 08 hrs

Unit 4 **Hydrographic Charts**: Introduction to Hydrographic Charts. Marginal Information and Depth Information of Hydrographic Charts. Scales of Hydrographic Charts. Recovery of Spatial Information from Hydrographic Charts. 08 hrs

Unit 5 **Cartographic models**: Inductive and Deductive Models, Model Flow Charting, Model Implementation and Verification. 08 hrs

Principles of Design and GIS Output, GIS Project design and Management.

Unit 6 **Remote Sensing satellites used for Cartography.** 08 hrs

References

1. Andy Mitchell, The ESRIGuide to GIS Analysis, Modeling Our World: ESRI Press, (2000). 12-15
2. Bonham – Carter G.F., Geographic Information System for Geoscientists, Pergamon Press, Tarrytown, New York, 1994. 1-34.
3. Burough, P.A., and Rachael A, Mec Donnell. Principles of Geographic Information System., Oxford University Press-1998, 22-39.
4. Demmers, M. N. 2000. Fundamentals of GIS, Willey Student Edition 1-498
5. Fraser Taylor., P.A., Geographic Information System – The Microcomputer and Modern Cartography, Pergamon Press, 1991. 6-14.

6. Heywood, Carnelin and Carven, 1998. An Introduction to Geographic Information System. Prentice Hall, 22-61.
7. Keaies, J. S. Cartographic design and Production London, Longman group, 1973. 2-45.
8. Les Worell, (Ed) 1990. Geographic Information System, Development and Applications, Belbaven Press. 11-24.
9. Lillesand T. M. and Kiefer, R. W. Remote Sensing and Image Interpretation. John Wiley & Sons Inc (2000). 8-33.
10. Longley, P. A., Maguire, D. J., Goodchild, M. F and Rhind, D. W; GIS Principles, Techniques, Applications and Managements, Longman Scientific and Technical, 2001 , 22-44.
11. Maguire, D. J. Goodchild, M. F., and Rhind, D. W. GIS- Principles and application, Longman Scientific and Technical, 1991.34-46.
12. Michael Zeiler, The ESRI Guide to Geodatabase Design. ESRI Press, (2000). 2-18.
13. Misra R. P. and A., Ramesh Publ., Prasaranga, Fundamentals of Cartography Mysore University. (1980). 2-34
14. Singh R. L., Elements of Practical Geography Publ. Kalyani Publishers, New Delhi (1995).
15. Thomas G. Lan Arc View 3D Analyst ESRI Press, (2000). 12-32.

GIS 504: DISASTER MANAGEMENT

Course Outcome:

CO1: Students will come to know on various kinds of disasters (natural and man-made) like earthquakes, floods, landslides, tsunamis, fires their causes and what kind of preparedness must be taken to minimize the impact of disasters.

CO2: Disaster Management Concepts of disaster; Types of disaster Natural and manmade : Cyclone, flood, land slide, land subsidence, fire and earthquake. Issues and concern for various causes of disasters.

CO3: Principles of Disaster Management, Natural Disasters, Hazards, Risks and Vulnerabilities.

Unit 1	Disaster Management Concepts of disaster; Types of disaster Natural and manmade : Cyclone, flood, land slide, land subsidence, fire and earthquake. Issues and concern for various causes of disasters. Principles of Disaster Management, Natural Disasters, Hazards, Risks and Vulnerabilities.	08 hrs
Unit 2	Assessment of Disaster Vulnerability of a location and vulnerable groups. Preparedness and Mitigation measures for various Disasters. Preparation of Disaster Management Plans.	08 hrs
Unit 3	**Issues in Environmental Health,** Water & Sanitation, Earthquake Mitigation, Floods, Fire, Landslides and other natural calamities. Post Disaster Relief & Logistics Management.	08 hrs
Unit 4	Emergency Support Functions and their coordination mechanism. Resource & Material Management. Management of Relief Camp.	08 hrs
Unit 5	Information systems &decision making tools. Role of Remote Sensing, Science & Technology. Rehabilitation Programmes	08 hrs
Unit 6	Voluntary Agencies & Community Participation at various stages of disaster management. Role of military and paramilitary forces during disaster.	08 hrs

References

1. Ecology, Environment & Pollution-A. Balasubramanian (1995) M/s. Indira Publishers, Mysore.
2. Atmosphere, Weather and Climate: An introduction to Meteorology-Narora-S. B. Saunders Co., Philadelphia
3. Physical Geology -A. N. Strahler
4. Meteorology - William L. Donn (1975) - McGraw-Hill Book Co., New York.
5. An introduction to Dynamic Meteorology - J. R. Holton (1992) - III Ed, Academic Press.
6. R.W. Tank: Focus on Environmental Geology (p.256)

GIS 505: Applied Geoinformatics in urban & infrastructure development

Course Outcomes:

CO1: The knowledge gained in the field of Geoinformatics can be effectively used to solve various earth related problems.

CO2: Understand the various applications of RS and GIS in different sectors like Agriculture, Urbanization, Rural development etc.

CO3: Explain the impacts of geospatial technologies on economic, social, institutional, and cultural practices locally and in the context of globalization.

CO4: Explain how governments and private organizations collect geospatial information for various purposes (e.g., population census, analyses of consumer behaviour, agriculture census etc)

Unit 1	Concepts- Urban, Urbanism, Urbanisation Regional Concept and Types Planning process, presentation and preparation Origin and Growth of Urbanisation in the World Urban Problems: Pollution, Slum, Housing, Social wellbeing	08 hrs
Unit 2	Globalisation, Regional spaces and Development Regional/Rural Development practices- India, Case Studies. Regional/Multilevel Planning and Vision 2020- case Studies.	08 hrs
Unit 3	Application of GIS,GPS and RS in Urban and Regional Planning Research Methods in Urban and Regional Studies	08 hrs
Unit 4	**RS and GIS Applications for Agriculture and Rural Development** Concept of Rural Development – Globalization and its impact on Agriculture and Rural Development Significance of agriculture – growth and development – types of agriculture Livestock (types of agriculture)	08 hrs
Unit 5	Use of RS and GIS technologies for Rural Development Use of RS and GIS for agriculture and watershed management Use of RS and GIS for Socio economic Information Analysis Agricultural Information System- Land Holdings – Irrigation, Land Use, Land Reforms	08 hrs
Unit 6	Application of RS and GIS in rural problem solving situation – Village Information System and planning. Planning in India – Development policies (Five Year Plans) Geo-informatics for Precision Farming- Importance and relevance to Indian Agriculture.	08 hrs

References

1. R.J. Chorley and P. Hayget, Socio-economic models in geography, 1967.
2. Lo, F and K. salih, growth pole strategy and regional development policy, oxford; pergaman press, 19708.
3. Harry W. Richardson, regional and urban economics, 19708.
4. R.P.Misra and K.V. Sundaram, Multilevel planning and integrated rural development in India, Heritage publishers, 19080.
5. Sartaz Aziz, road to rural to rural development in china.
6. Lewis Keeble, principles and practice of town and country planning, the estimates gazette Ltd., London, 1964.
7. Gideon Sjoberg, The origin and evolution of cities, scientific American, 1965.
8. John N. Jackson, the urban future, George Allen and Unwin Ltd., London, 1972.
9. Charles Korea, Report on the national commission on urbanization, 190808.
10. Peter hall, Urban and Regional planning, Penguin books, Middlesex, 1976.
11. Gordon E. Cherry, Urban Planning problems. Leonard Hill, London, 1974.
12. P.E.James and C.F. Jones, American geography: Inventory and Prospect, Rawat, Jaipur.
13. Hyderabad 2020, Master plan for HMA, 2003.
14. Leonard Riesman, The urban process, free press, London, 1964.
15. Harold M. Mayer and Clyde F. Kohn, Readings in urban geography, university of Chicago, 1967.
16. Stanley D. Brunn and Jack F. Williams, Cities of the world, World regional urban development, Harper and Row publishers, New York, 19083.
17. A.C, Mohapatra and Jay ant K.Routray, Regional development and anning,Rawat, Jaipur, 19908.
18. Vision 2020, Government of AP, Hyderabad, 19908.
19. Alam, SM, Hyderabad – Secunderabad, Twin Cities, Asia publishing House, Bombay, 1964.
20. Curran Paul J, Principles of R.S, English Language book society, London, 190808.
21. Gibbs, Jack P., Urban Research Methods, East West Edition, New Delhi, 1966.
22. Many Globalizations.

GIP 506: DIGITAL IMAGE PROCESSING AND CARTOGRAPHY (LAB S)

Course Outcome:

CO1: Digital Image processing involves the manipulation and interpretation of digital images acquired by satellites, with the help of a computer. They will be capable of handling various image processing softwares for analysing the satellite data.

Digital Image Processing Lab

ERDAS Imagine

- Geometric Correction
- Radiometric correction
- Histogram construction for digital data
- Outputs of linear and non-linear stretch
- 5.Filtered outputs
- Ratio images
- Change detection analysis
- Image classification based on digital values
- Unsupervised classification
- 10.Supervised classification.

CARTOGRAPHY

Topographic Sheets: Identification of Symbols and Interpretation of Central Themes. Retrieval Secondary Data**.**

Thematic Mapping: Geomorphology, Slope, Elevation, Stream Network, Drainage Patterns, Resources and Bathymetry.

Population Density: Grid pattern distribution of population, Dot mapping, Multi Dot mapping and Settlement Mapping.

Representation of Thematic Data: Application of Histograms, Pie Charts, Wind Roses, Ray Diagrams**.** Contour Map construction of Pressure Gradient, Rainfall, Temperature, Wind velocity.Choroschematic mapping.

Multi-dated Thematic Mapping: Shoreline Changes, Forest Cover Changes, Population Diffusion/Urban Growth mapping.

GIP 507: WATERRESOURCES AND MARINE GEOINFORMATICS (lab S)

Course Outcome:

CO1: Water resources are the important natural resources and the knowledge of river basins, their catchments, geology and geomorphology will help to manage the water resources in a sustainable manner.

Use of MapInfo/ArcView in quantification of Lakes, Water Bodies, Reserved Forest & Urban Sprawl.

Identification of Drainage pattern, Computation of Stream Density, Stream Frequency,

Ruggedness Number, Thyessen polygons, Precipitation contours, Flow net etc.

Generation of Groundwater potential zone mapping

Isohytal map generation and interpretation

Construction of Chlorophyll-a, SST, Depth, Salinity, Biomass, Total Suspended Matter, Biomass, Distribution Maps.

Instrumentation in *In-situ* collection of Oceanographic Data: Secchi Disc, Water Samplers, Grab Samplers, Anemometers, D. O., Salinity, pH meters etc.

Field Mapping of Coastal Geomorphic Attributes.

CRZ mapping using topographic sheets, Hydrographic charts, Air photographs, Digital data products.

Mapping of Riverine, Beach, Tidal Flat, Rocky and Sandy shore environments from aerial photographs.

Identification & Description of Oceansat, Modis, and other Oceanographic Satellite Images.

GIE 508: GEOINFORMATICS OF COASTAL ENVIRONMENTS (OPEN ELECTIVE)

Course Outcomes:

CO1: Students from different disciplines will understand the basics of geoinformatics

CO2: They can make use of this technology quite effectively for the generation of maps related to coastal information ssystem, coastal landforms etc.

CO3: Concepts of Geoinformatics. Outlines of Remote Sensing, Air Photo Interpretation, and Geographic Information System. Arial photos and remote sensing of coastal environment

CO4: Various tools of Geoinformatics can be effectively used to understand the coastal environment. Geoinformatics of coastal environment will help the students in understanding the coastal environment in a better way.

Unit 1	**Introduction:** Concepts of Geoinformatics. Outlines of Remote Sensing, Air Photo Interpretation, and Geographic Information System. Arial photos and remote sensing of coastal environment	06 hrs
Unit 2	**Outlines of Indian Satellites**: Indian space Program, Scientific Payloads from India and abroad, Bhuvan: Description of 3D Satellite Mapping. IRS-P4, Ocean Sat-II: Description and Payloads. IRS-IC/D. A brief note on Hyperspectral Remote Sensing. Resourcesat, Cartosat-I & II etc.	06 hrs
Unit 3	**Data and Data products:** List of Data and Data Models. Digital Data Products, Topographic Sheets and Theme Analysis, Hydrographic Sheets, Outlines of the I.H.O. Bathymetric measurements and outlines of Echosounders and Multibeam unit.	06 hrs
Unit 4	**Coastal Environments**: Geomorphology of Coasts. Classification of Coastal Environments. Relevance Geology and Geotectonics to the genesis of coasts.	06 hrs
Unit 5	**Spatial Analysis of Coastal Environments:** Collection of Spatial Data from Coastal Environments. Data Interpretation and use of GIS in modeling studies.	06 hrs
Unit 6	**Coastal Regulations and Zones:** Outlines of CRZ-I, CRZ-II, CRZ-III and CRZ-IV. Amendments to the CRZ norms	06 hrs
Unit 7	**Coastal Development:** Definition and Description of Ports and Harbours. Application of EIA and CRZ to development Ports and Harbours. EIA Norms and Criteria for Recreation and Water sports.	06 hrs
Unit 8	**Coastal Information System:** Concepts of a Coastal Information System. Use of GIS in developing a Coastal Information System. Use of RS and GIS in developing coastal information system.	06 hrs

References

1. Áine Ryall 2009, Effective Judicial Protection and the Environmental Impact Assessment Directive in Ireland. Hbk, 1-332.
2. Aradhana, A. 2006, "Special Economic Zones: Revisiting the Policy Debate",. Economic and Political Weekly, Vol. XLI Nos. 43 and 44, 4-10

3 Aradhana, A. 2009, Genesis, Evolution, and the Changing Role of SEZs in Asi : 4. A Comparative Analysis of Taiwan. Korea and India, Mimeo, Korean Institute of Economic Policy (KIEP).2-12.

5. Berling, G.L. and Roy, W.W. 1989.Application of Aerial Photographs and Remote sensing Imagery in Urban research and studies. Monticell,6-33.
7. Bonham- Carter G.F., 1994. Geographic Information System for Geoscientists,
8. Pergamon Press, Tarrytown, New York, 6-9.

9 Brench, M. C., 1971 City. Planning and Aerial information. Harvard University, Cambridge.12-45.

10. Burough, P. A., 1986. Principles of Geographic Information systems for Land Resources Assessment, Clarendon Press, Oxford, 1-194.
11. Land, T. G.,1999 1999 ArcView-3D Analyst. ESRI press.6-23.

12 Michael Zeiler 1999 The ESRI Guide to GIS Analysis Vol I. ESRI press.4-16.

13 Michael Zeiler, Modeling Our World: The ESRI Guide to Geodatabase Design. ESRI press. 3-7.

14 Prabha Shastri Ranade, 2009, Special *Economic Zones: Global And Indian*

15 *Experiences*, ISBN: 8131411559, Publ: ICFAI, 324pp.

16 Sabine Latteman, 2010, Development of an Environmental Impact Assessment and Decision Support System.12-23.

17 Wood, C., 1995, Environmental Impact Assessment –Acomparative Review. 1-337.

FOURTH SEMESTER

GI 551: Dissertation

Course outcome:

CO1: The knowledge gained can successfully be utilised to generate thematics maps and to solve the problems related to earth and its environment.
CO2: Students can carry out consultancy work independently
CO#: They can join various government/private organisations.

Each student is required to undertake a project work under the supervision of a faculty member. It shall consist of 36 hours of Project work per week and include the entire fourth semester and the students shall carryout their project work either in a software company, GIS application company, Remote Sensing company or any research institution such as NIO, INCIOS, CESS, C-GIST, NCAOR, etc. In house project work with an affiliation of an external company or research institution with and external guide will also be considered for project work in the last (fourth) semester. The project work will be used to provide a dissertation that shall be submitted to the Chairman BoE. For evaluation as per the regulations for Geo-informatics. A viva- voce shall be mandatory as provided in the regulations for Geo-informatics M.Sc. course. After the dissertation work is completed, students shall submit dissertation/thesis based on the results obtained. The dissertation is evaluated by internal and external examiners. The total of the fourth semester shall be of twenty credits only.	300 marks

Viva -Voce

Each student has to present the dissertation work carried out by him/her in front of the examiners (internal and external)	100 marks

Field Work

Field work carried out by the students under the guidance of faculty members will be evaluated by all the concerned teacher**s.**	100 marks

Field Report

The field report submitted by the students under the supervision of faculty member(s) will be evaluated by the concerned teacher(s)**.**	50 marks